

AMENDED CLAIMS

[received by the International Bureau on 06 July 2005 (06.07.2005);
original claim 1 amended; original claims 13-18 renumbered ;
remaining claims unchanged (4 pages)]

1. A valve assembly for a pump, comprising;
a pump chamber having a first recess formed therein;
a pump head having a second recess formed therein, said second recess cooperating with said first recess to define a first valve compartment including a first valve pocket and an opposed first valve seat; and
a flexible first valve element disposed between said first and second recesses and adapted to move between a closed position against said first valve seat which prevents fluid flow and an open position away from said first valve seat which permits fluid flow in a first direction;
wherein the dimensions of said first valve compartment are selected to limit the movement of said first valve element in the open position.

2. The valve assembly of claim 1, further comprising:
a third recess formed in said pump chamber;
a fourth recess formed in said pump head, said fourth recess cooperating with said third recess to define a second valve compartment including a second valve pocket and an opposed second valve seat; and
a flexible second valve element disposed between said third and fourth recesses and adapted to move between a closed position against said second valve seat which prevents fluid flow and an open position away from said second valve seat which permits fluid flow in a second direction;
wherein the dimensions of said second valve compartment are selected to limit the movement of said second valve element in the open position.

3. The valve assembly of claim 2 wherein:

one of said valve elements is an intake valve for permitting flow from an intake port to a pump, and the other of said valve elements is an outlet valve for permitting flow from said pump to an outlet port; and

the dimensions of said first and second valve compartments are selected to limit the movement of said first and second valve elements when said pump is moving a fluid flow from said inlet port through said pump to said outlet port, such that at least one of said valve elements is always in the closed position.

4. The valve assembly of claim 3 wherein said first and second valve elements comprise an elastomeric material.

5. The valve assembly of claim 4 wherein said first and second valve elements comprise ethylene propylene diene terpolymer.

6. The valve assembly of claim 4 wherein said first and second valve elements comprise a fluoroelastomer.

7. The valve assembly of claim 4 wherein said first and second valve elements comprise a perfluoroelastomer.

8. The valve assembly of claim 4 wherein said first and second valve elements comprise silicone.

9. The valve assembly of claim 4 wherein said first and second valve elements have a hardness from about 40 Durometer to about 90 Durometer.

10. A pump assembly, comprising:
a pump chamber having a first recess formed therein;
a pump head having housing having a second recess formed therein, said second recess cooperating with said first recess to define a first valve compartment including a first valve pocket and an opposed first valve seat; and
a flexible first valve element having a selected first thickness disposed between said first and second recesses and adapted to move through a stroke

length between a closed position against said first valve seat which prevents fluid flow and an open position away from said first valve seat which permits fluid flow;

wherein the dimensions of said first valve compartment are selected to limit the stroke length of said first valve element to less than about 1.6 times said first thickness.

11. The valve assembly of claim 10 further comprising:

a third recess formed in said pump chamber;

a fourth recess formed in said pump head, said fourth recess cooperating with said third recess to define a second valve compartment including a second valve pocket and an opposed second valve seat; and

a flexible second valve element having a selected second thickness disposed between said third and fourth recesses, and adapted to move between a closed position against said second valve seat which prevents fluid flow and an open position away from said second valve seat which permits fluid flow in a second direction;

wherein the dimensions of said second valve compartment are selected to limit the stroke length of said second valve element to less than about 1.6 times said second thickness.

12. The valve assembly of claim 11 wherein the dimensions of said first and second valve compartments are selected such that the stroke lengths of said first and second valve elements are from about 0.19 times the thickness of the respective valve element to about 0.93 times the thickness of the respective valve element.

13. The valve assembly of claim 12 wherein said first and second valve elements comprise an elastomeric material.

14. The valve assembly of claim 12 wherein said first and second valve elements comprise ethylene propylene diene terpolymer.

15. The valve assembly of claim 12 wherein said first and second valve elements comprise a fluoroelastomer.

16. The valve assembly of claim 12 wherein said first and second valve elements comprise a perfluoroelastomer.

17. The valve assembly of claim 12 wherein said first and second valve elements comprise silicone.

18. The valve assembly of claim 12 wherein said first and second valve elements have a hardness from about 40 Durometer to about 90 Durometer.

WHAT IS CLAIMED IS:

1. a valve assembly for a pump, comprising;

a pump chamber having a first recess formed therein;

a pump head having a second recess formed therein, said second recess cooperating with said first recess to define a first valve compartment including a first valve pocket and an opposed first valve seat; and

a flexible first valve element disposed between said first and second recesses and adapted to move between a closed position against said first valve seat which prevents fluid flow and an open position away from said first valve seat which permits fluid flow in a first direction;

wherein the dimensions of said first valve compartment are selected to limit the movement of said first valve element in the open position.

2. The valve assembly of claim 1, further comprising:

a third recess formed in said pump chamber;

a fourth recess formed in said pump head, said fourth recess cooperating with said third recess to define a second valve compartment including a second valve pocket and an opposed second valve seat; and

a flexible second valve element disposed between said third and fourth recesses and adapted to move between a closed position against said second valve seat which prevents fluid flow and an open position away from said second valve seat which permits fluid flow in a second direction;

wherein the dimensions of said second valve compartment are selected to limit the movement of said second valve element in the open position.

3. The valve assembly of claim 2 wherein:

one of said valve elements is an intake valve for permitting flow from an intake port to a pump, and the other of said valve elements is an outlet valve for permitting flow from said pump to an outlet port; and

the dimensions of said first and second valve compartments are selected to limit the movement of said first and second valve elements when said pump is moving a fluid flow from said inlet port through said pump to said outlet port, such that at least one of said valve elements is always in the closed position.

4. The valve assembly of claim 3 wherein said first and second valve elements comprise an elastomeric material.

5. The valve assembly of claim 4 wherein said first and second valve elements comprise ethylene propylene diene terpolymer.

6. The valve assembly of claim 4 wherein said first and second valve elements comprise a fluoroelastomer.

7. The valve assembly of claim 4 wherein said first and second valve elements comprise a perfluoroelastomer.

8. The valve assembly of claim 4 wherein said first and second valve elements comprise silicone.

9. The valve assembly of claim 4 wherein said first and second valve elements have a hardness from about 40 Durometer to about 90 Durometer.

10. A pump assembly, comprising:

a pump chamber having a first recess formed therein;

a pump head having housing having a second recess formed therein, said second recess cooperating with said first recess to define a first valve compartment including a first valve pocket and an opposed first valve seat ; and

a flexible first valve element having a selected first thickness disposed between said first and second recesses and adapted to move through a stroke

length between a closed position against said first valve seat which prevents fluid flow and an open position away from said first valve seat which permits fluid flow;

wherein the dimensions of said first valve compartment are selected to limit the stroke length of said first valve element to less than about 1.6 times said first thickness.

11. The valve assembly of claim 10 further comprising:

a third recess formed in said pump chamber;

a fourth recess formed in said pump head, said fourth recess cooperating with said third recess to define a second valve compartment including a second valve pocket and an opposed second valve seat; and

a flexible second valve element having a selected second thickness disposed between said third and fourth recesses, and adapted to move between a closed position against said second valve seat which prevents fluid flow and an open position away from said second valve seat which permits fluid flow in a second direction;

wherein the dimensions of said second valve compartment are selected to limit the stroke length of said second valve element to less than about 1.6 times said second thickness.

12. The valve assembly of claim 11 wherein the dimensions of said first and second valve compartments are selected such that the stroke lengths of said first and second valve elements are from about 0.19 times the thickness of the respective valve element to about 0.93 times the thickness of the respective valve element.

11. The valve assembly of claim 12 wherein said first and second valve elements comprise an elastomeric material.

12. The valve assembly of claim 12 wherein said first and second valve elements comprise ethylene propylene diene terpolymer.

13. The valve assembly of claim 12 wherein said first and second valve elements comprise a fluoroelastomer.

14. The valve assembly of claim 12 wherein said first and second valve elements comprise a perfluoroelastomer.

15. The valve assembly of claim 12 wherein said first and second valve elements comprise silicone.

16. The valve assembly of claim 12 wherein said first and second valve elements have a hardness from about 40 Durometer to about 90 Durometer.